

## The BioFrankel-3: A Functional Approach

[PAOLA COZZA, MD, DDS, MS](#)

[ALESSANDRA MARINO, DDS, MS](#)

[MANUELA MUCEDERO, DDS](#)

A Class III malocclusion typically involves a concave profile, a retrusive nasomaxillary area, and a protrusive lower lip.<sup>1-4</sup> Early treatment is often attempted to change the unfavorable growth pattern, correct functional abnormalities, and possibly avoid later surgical intervention.<sup>5-7</sup> Substantial profile improvement can be achieved because of the tendency of the soft-tissue drape to follow dentoskeletal changes.

Studies have demonstrated that functional appliance treatment can have a significant effect on the direction of condylar growth and, consequently, on mandibular size and shape.<sup>8,9</sup> The optimum timing to improve Class III skeletal relationships appears to be in the early rather than the late mixed dentition.<sup>10,11</sup>

The present article shows the effects of early treatment on a young child with Class III malocclusion and anterior crossbite, using a functional appliance we call the "BioFrankel-3".

### Appliance Design

The BioFrankel-3 is similar to the classic Balters bionator<sup>12,13</sup> with the palatal omega loop reversed for Class III correction, except that it incorporates upper labial pads as in the FR-3 appliance (Fig. 1). The labial pads lie above the upper incisors and anterior to the maxillary mucosa and are removable from the facebow tubes fixed in the acrylic. These pads function to eliminate the restrictive pressure of the upper lip on the underdeveloped maxilla, stimulating bone apposition on the labial alveolar surfaces.<sup>14</sup>

The anterior labial arch rests against the lower anterior teeth with minimal active pressure. As in the FR-3 appliance, the labial arch induces tension of the soft tissue in the vestibular fold, with the aim of expanding and remodeling the dentoalveolar arch and the apical base, eliminating pressure, and applying traction.

The working bite should be taken in the most retruded position possible, allowing slight interincisal clearance for correction of the anterior crossbite. To allow for tooth eruption, the posterior acrylic is progressively relieved as the crossbite improves.

### Case Report

A 5-year-old male in the primary dentition was referred by his pediatric dentist for treatment of a Class III malocclusion. He presented with a skeletal Class III relationship, a concave profile, and complete crossbite of the maxillary incisors (Fig. 2, Table 1). Both arches were well aligned, although the maxilla appeared to be short.

The patient wore a BioFrankel-3 appliance at least 14-16 hours a day (Fig. 3). After two months of treatment, the crossbite was partially corrected. Eruption of the posterior teeth was controlled by selectively reducing the interocclusal acrylic.

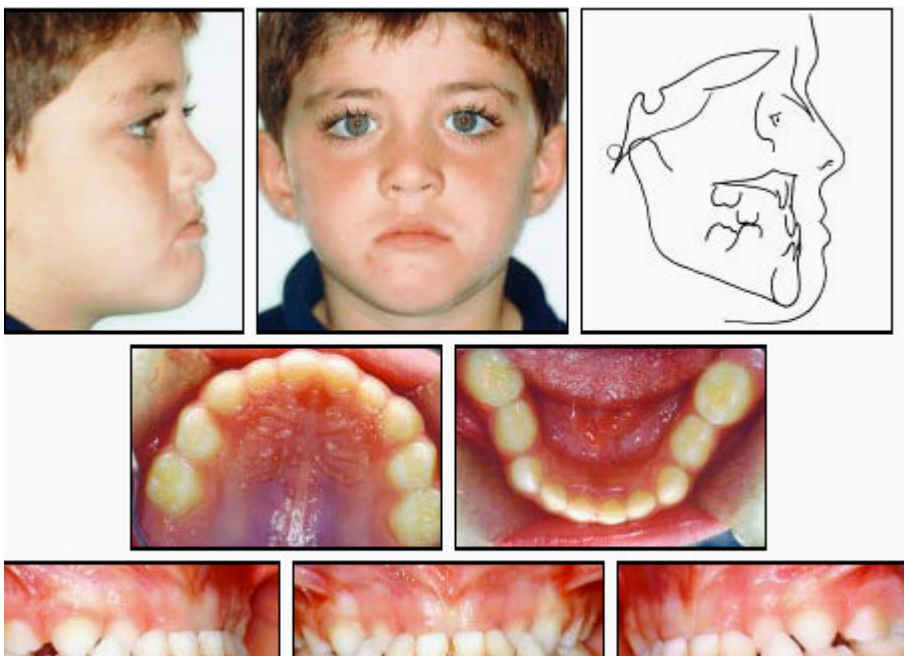
Complete correction of the anterior crossbite and a significant improvement in the Class III malocclusion were seen after 16 months of treatment with the BioFrankel-3 (Fig. 4). Full-time wear was then discontinued, but the patient continued to wear the appliance at night for retention.

A good interocclusal relationship and a normal overbite and overjet were achieved (Fig. 5, Table 1). Cephalometric records showed excellent skeletal relationships and an improved profile. There was no apparent effect on temporomandibular joint function. •

## FIGURES



**Fig. 1** BioFrankel-3 functional appliance.





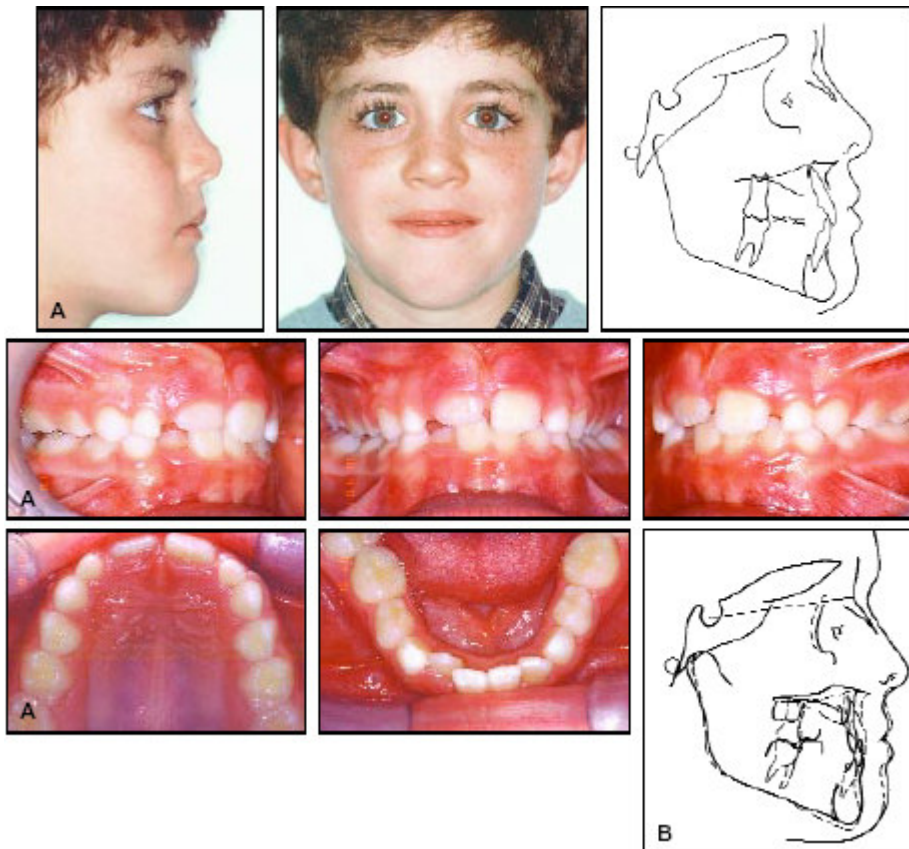
**Fig. 2** 5-year-old male Class III patient before treatment.



**Fig. 3** BioFrankel-3 appliance.



**Fig. 4** Correction of anterior crossbite after 16 months of treatment.



**Fig. 5** A. Patient after eight months of retention. B. Superimposition of cephalometric tracings before and after treatment.

## TABLES

**TABLE 1**  
**CEPHALOMETRIC DATA**

|              | Pretreatment | Post-Treatment |
|--------------|--------------|----------------|
| SNA          | 84°          | 86°            |
| SNB          | 86°          | 83°            |
| ANB          | -2°          | 3°             |
| NA           | -2mm         | 0mm            |
| NPg          | 0mm          | -1mm           |
| FMA          | 23°          | 27°            |
| SN-GoGn      | 29°          | 32°            |
| Occl. P-FP   | 15°          | 15°            |
| IMPA         | 78°          | 84°            |
| FMIA         | 79°          | 69°            |
| 1-FP         | 98°          | 104°           |
| Interincisal | 163°         | 142°           |
| Z            | 79°          | 77°            |
| E line UL    | -4mm         | -2mm           |
| E line LL    | 0mm          | 0mm            |
| NS-SAr       | 124°         | 113°           |
| SAr-ArGo     | 137°         | 151°           |
| ArGo-GoMe    | 132°         | 126°           |
| ArGo-GoN     | 55°          | 52°            |
| NGo-GoMe     | 77°          | 74°            |
| Somme        | 393°         | 390°           |

**Table. 1**

## REFERENCES

- 1 Campbell, P.M.: The dilemma of Class III treatment: Early or late? *Angle Orthod.* 53:175-191, 1983.
- 2 Kiliçoglu, H. and Kirliç, Y.L.: Profile changes in patients with Class III malocclusions after Delaire mask therapy, *Am. J. Orthod.* 113:453-62, 1998.
- 3 Ngan, P.; Hagg, U.; Yiu, C.; Merwin, D., and Wei, S.H.: Soft tissue and dentoskeletal profile changes associated with maxillary expansion and protraction headgear treatment, *Am. J.*
- 4 Sato, S.: Case Report: Developmental characterization of skeletal Class III malocclusion, *Angle Orthod.* 64:105-111, 1994.
- 5 Baccetti, T.; McGill, J.S.; Franchi, L.; McNamara, J.A.; and Tollaro, I.: Skeletal effects of early treatment of Class III malocclusion with maxillary expansion and face-mask therapy, *Am. J. Orthod.* 113:333-343, 1998.
- 6 Baccetti, T. and Tollaro, I.: Aretrospective comparison of functional appliance treatment of Class III malocclusions in the deciduous and mixed dentitions, *Eur. J. Orthod.* 20:309-317, 1998.
- 7 Saadia, M. and Torres, E.: Sagittal changes after maxillary protraction with expansion in Class III patients in the primary, mixed, and late mixed dentitions: A longitudinal retrospective study, *Am. J. Orthod.* 117:669-680, 2000.

- 8** Tollaro, I.; Baccetti, T.; and Franchi, L.: Craniofacial changes induced by early functional treatment of Class III malocclusion, *Am. J. Orthod.* 109:310-318, 1996.
- 9** Tollaro, I.; Baccetti, T.; and Franchi, L.: Mandibular skeletal changes induced by early functional treatment of Class III malocclusion: A superimposition study, *Am. J. Orthod.* 108:525-532, 1995.
- 10** Firatlı, S. and Ulgen, M.: The effects of the FR-3 appliance on the transversal dimension, *Am. J. Orthod.* 110:55-60, 1996.
- 11** Franchi, L.; Baccetti, T.; and Tollaro, I.: Predictive variables for the outcome of early functional treatment of Class III malocclusion, *Am. J. Orthod.* 112:80-86, 1997.
- 12** Acht, B.: *Teoria e Tecnica del Metodo Bionator di Balters*, Ed. Pro-Stomatologia, Milan, Italy, 1967.
- 13** Balters, W.: *Il Bionator ed i Suoi Elementi*, Ed. Pro-Stomatologia, Milan, Italy, 1967.
- 14** McNamara, J.A. Jr. and Brudon, W.: *Orthodontic and Orthopedic Treatment in the Mixed Dentition*, Needham Press, Ann Arbor, MI, 1993.